

REMARKS

A. The Final Office Action

In the Final Office Action, claims 1-3 and 6-18 are rejected under 35 USC §103.

In summary of this Response, claim 2 is canceled, claims 1, 3, 14, 15, and 17 are amended, and remarks are provided.

B. Rejection of Claims

Claims 1-3, 6 and 8-17 are rejected based on a combination of the Bigo et al. article, and newly-applied Watanabe, U.S. Patent No. 5,596,667 (the '667 patent), which is the earlier patent of the inventor herein.

Claims 7 and 18 are rejected as obvious based on the above-discussed combination, and further in view of the Watanabe Article, "Simultaneous Wavelength..." ("Watanabe article"). The Watanabe article includes the inventor herein as a co-author.

For the following reasons, it is respectfully submitted that the present invention, as recited by amended claims 1, 3 and 6-18, was not rendered obvious by the cited art.

Modulation

The optical device of amended claim 1 includes a nonlinear optical medium for performing amplitude modulation of a continuous wave to obtain light having a wavelength λ_c by four-wave mixing using the signal light as pump light.

The optical device of Bigo et al. locks laser frequency based on an information frequency using an SOA (see, e.g., pg. 1214, right column, 2nd paragraph).

The optical device of amended claim 1 can modulate the continuous wave until the frequency of the signal light becomes terabit. But the upper limit of the modulation frequency of Bigo et al. is about a 20 gigabit frequency because it uses only SOA frequency modulation. See, e.g., pg. 1211, left column, line 1.

The format of the signal light of amended claim 1 is not restricted for the amplitude modulation of the continuous wave. However, the format of soliton data of Bigo et al. is restricted to an RZ or NRZ format for frequency modulation in an SOA.

Filter

The optical bandpass filter of amended claim 1 passes only the modulated signal light having wavelength λ_c to pass, not other light which contains modulated phase conjugate light, or signal light produced by four-wave mixing having a wavelength other than λ_c . But Bigo et al.'s filter only selects the laser wavelength (pg. 1214, right column, 3rd paragraph).

Therefore, the optical bandpass filter of amended claim 1 is significantly and non-obviously different from the filter of Bigo et al. in regard to the operation of the filters.

As noted above, it is believed that Bigo et al. at least fails to teach or disclose the recited modulation and filter features of independent claim 1. It is further believed that the secondary reference, Watanabe '667, fails to compensate for the above-discussed and other incomplete teaching of Bigo et al. for the following reasons.

Use of Signal Light

The optical device of amended claim 1 uses the signal light directly inputted into the nonlinear optical medium 16 as pump light.

Watanabe '667 uses modulated light of a pump laser diode as the signal light as pump light. Therefore, the optical device of the amended claim 1 is significantly different from the device of Watanabe '667 regarding the recited use of the signal light as pump light.

Modulation

The nonlinear optical medium of amended claim 1 performs amplitude modulation of the continuous wave having the wavelength λ_c to produce light having the wavelength λ_c by four-wave mixing using the signal light as pump light.

The nonlinear optical medium of Watanabe '667 performs amplitude modulation of the continuous wave having the wavelength λ_c to produce phase conjugate light by four-wave mixing uses the modulated light of a pump laser diode by the signal light as pump light and using light of the probe laser diode as probe light. That is, the modulated light of amended claim 1 is different from the modulated light of Watanabe '667 regarding the wavelength of the respective lights.

Watanabe '667 discloses that amplitude modulated phase conjugate light can be used a output. If this disclosure is applied to the device of the Bigo et al., the wavelength of a clock is the same as the wavelength of the phase conjugate light.

Watanabe '667 assumes that no idler light whose wavelength is the same as the phase conjugate light is input to the nonlinear medium (column 26, lines 22-23). As the phase conjugate light is fed back and input to the nonlinear medium as idler light, the phase conjugate light can not be modulated. (columns 26 and 27).

In order to perform mode locking by using four-wave mixing in the nonlinear medium based on the suggested Bigo et al. and Watanabe '667 combination, the phase conjugate light of Watanabe '667 should not be used, and instead a light whose wavelength is the same as the probe light should be used. However, neither Bigo et al. nor Watanabe '667 teach or suggest this point. That is, even if the device of Watanabe '667 is applied to the device of Bigo et al., the combination cannot perform amplitude modulate using four-wave mixing in the nonlinear medium and mode locking.

Further, in order to use a light whose wavelength is the same as the probe light to perform mode locking, it is necessary to separate phase conjugate light and light having wavelength λ_s and input only light having wavelength λ_c into the nonlinear medium. The optical bandpass filter of amended claim 1 performs this function. However, Bigo et al. and Watanabe '667 do not teach or suggest this feature.

In light of the above significant and non-obvious differences between the cited art and amended independent claim 1 herein, it is submitted that claim 1 is not rendered obvious by Bigo et al. in view of Watanabe '667.

Independent claims 14, 15, and 17 generally have been amended to include the features of amended claim 1 discussed above, and the above comments are also applicable thereto. Therefore, amended claims 14, 15, and 17 also are not rendered obvious over Bigo et al. in view of Watanabe '667.

CONCLUSION

In light of the above amendments and remarks, it is respectfully submitted that claims 1, 3, and 6-18 are now in condition for allowance.

If there are any additional fees associated with this Response, please charge same to our Deposit Account No. 19-3935.


Finally, if there are any formal matters remaining after this Responses, the undersigned would appreciate a telephone conference with the Examiner to attend to these matters.

Respectfully submitted,

Serial No. 09/560,723

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Date: 2/29/04

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